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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,336	10/28/2003	Peter J. Geiss	BUR920010184US2	4852

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SCHMEISER, OLSEN & WATTS  
22 CENTURY HILL DRIVE  
SUITE 302  
LATHAM, NY 12110

EXAMINER
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DOTY, HEATHER ANNE

ART UNIT	PAPER NUMBER
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2813

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/695,336

Applicant(s)

GEISS ET AL.

Examiner

Heather A. Doty

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 23-25, 40 and 42-60 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 23-25, 47, 48 and 50-60 is/are allowed.
- 6) ☒ Claim(s) 40, 42-46 and 49 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                             |                                                                                         |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                 | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____                                                |

## **DETAILED ACTION**

### ***Claim Objections***

Claim 25 is objected to because of the following informalities: Claim 25 recites in line 2 "a single-crystal subcollector in direct contact with a top surface of a single-crystal collector." However, as depicted in Figs.6-11, the subcollector is in direct contact with a *bottom* surface of the single-crystal collector. The examiner assumes that line 2 of claim 25 is meant to read "a single-crystal subcollector in direct contact with a bottom surface of a single-crystal collector." Appropriate correction is required.

Claim 49 is objected to because of the following informalities: Claim 49 recites the limitation "said polysilicon grain size modulating species" in line 4. There is insufficient antecedent basis for this limitation in the claim. Applicants' remarks dated 8/3/2006 indicate that claim 49 was amended to overcome this same objection made in the previous Office action, but it appears that the claim has not been amended. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 40, 42-45, and 49 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueno et al. (U.S. 4,875,085).

Regarding claim 40, Ueno et al. teaches a single-crystal silicon collector region (12 in Fig. 9; column 3, lines 47-52); a single-crystal silicon base region in said collector region (13 in Fig. 9); a poly-crystal silicon emitter layer in direct contact with a top surface of said emitter region, said emitter layer containing an arsenic species and an antimony species (layer 15 in Fig. 9; claim 1).

Regarding claims 42 and 43, Ueno et al. teaches the bipolar transistor of claim 40. It is further inherent that the base current of said bipolar transistor is higher than the base current of an identical bipolar transistor fabricated without said antimony species, and the resistance of said emitter of said bipolar transistor is lower than the emitter resistance of an identical bipolar transistor fabricated without said antimony species (Ueno et al. does not expressly teach these properties, but it is inherently the case, as disclosed by Applicant in the instant specification on page 21, lines 10-12—the presence of antimony in the polysilicon emitter increases base current—and on page 22, lines 12-16—the presence of antimony in the polysilicon emitter decreases emitter resistance).

Regarding claim 44, Ueno et al. teaches the bipolar transistor of claim 40. It is further inherent that a silicon grain size of said polysilicon emitter layer of said bipolar transistor is greater than a silicon grain size of a polysilicon emitter layer in an identical bipolar transistor fabricated without said antimony species (the instant specification teaches that antimony increases the grain size of polysilicon, after annealing—page 7, line 17 – page 8, line 1).

Regarding claim 45, Ueno et al. teaches the bipolar transistor of claim 40, and further teaches that the dopant species, arsenic, is implanted into said polysilicon emitter at a dose of  $1\text{E}15$  to  $2.3\text{E}16$  atoms/cm<sup>2</sup> and at an energy of about 40 to 70 keV (column 3, line 64 – column 4, line 1) and the antimony species is implanted into said polysilicon emitter layer at a dose of  $1\text{E}15$  to  $1.5\text{E}16$  atoms/cm<sup>2</sup> and at an energy of 30 to 70 keV (claim 1 teaches implanting one or both of arsenic and antimony; column 4, lines 1-5 teach antimony as a substitution for arsenic, so in the case that arsenic and antimony are both implanted, it is in the energy and dose ranges given for the arsenic implant, which overlaps with the claimed ranges for the antimony energy and dose in claim 45).

Regarding claim 49, Ueno et al. teaches the bipolar transistor of claim 40. It is further inherently the case that a concentration of dopant is higher at a predetermined distance from a bottom surface of said emitter layer than a concentration of dopant at the same pre-determined distance from a bottom of an identical emitter layer of an identical bipolar transistor without said antimony (the instant specification discloses that the addition of antimony causes a concentration of dopant to be higher at a predetermined distance from a bottom surface of the polysilicon emitter than a concentration of dopant at the same predetermined distance from a bottom of an identical polysilicon emitter of an identical bipolar transistor without antimony—page 20, lines 10-17; Fig 13. Although the data shown in Fig. 13 were collected on the device taught by Applicant, Applicant does not disclose the criticality of any difference in structure of their claimed transistor versus the one taught by Ueno et al. Applicant

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teaches that the presence of antimony in the polysilicon emitter layer causes this claimed dopant concentration profile, and since Ueno et al. teaches a similar bipolar transistor to the one taught by Applicant, containing a polysilicon emitter layer doped with arsenic and antimony, it is inherently the case that the dopant concentration profile for the device taught by Ueno et al. would mimic that taught by Applicant).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueno et al. (U.S. 4,875,085) in view of Morishita (U.S. 5,708,281).

Regarding claim 46, Ueno et al. teaches the bipolar transistor of claim 40 (note 35 U.S.C. 102(b) rejection above), but does not teach that the base region includes germanium.

Morishita teaches a bipolar transistor with a base region that includes germanium to narrow the band gap (column 11, lines 11-20). Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Ueno et al. and Morishita by fabricating a bipolar transistor according to the method taught by Ueno et al., and further add germanium to the base region, as taught by

Morishita. The motivation for doing so at the time of the invention would have been to narrow the band gap, as expressly taught by Morishita.

***Allowable Subject Matter***

Claims 23-25, 47, 48, and 50-60 would be allowed if claim 25 were written to overcome the objection made above.

The following is a statement of reasons for the indication of allowable subject matter: Prior art does not teach or suggest, in combination with the other claimed limitations, a bipolar transistor comprising both a polysilicon emitter containing a dopant species and a polysilicon grain size modulating species and a single-crystal intrinsic base comprising a doped SiGe layer between an undoped SiGe layer and an undoped Si layer.

Ueno et al., the closest prior art of record, teaches a bipolar transistor with a polysilicon emitter containing a dopant species and a polysilicon grain size modulating species, but does not teach a single-crystal intrinsic base comprising a doped SiGe layer between an undoped SiGe layer and an undoped Si layer.

Shoji et al. (U.S. 5,323,031) teaches a bipolar transistor having a polycrystalline emitter layer (251 in Fig. 10C) containing arsenic and carbon (Fig. 10c), and a base region containing a SiGe alloy region (24 in Fig. 4B), but does not teach that the base region is a single-crystal intrinsic base comprising a doped SiGe layer between an undoped SiGe layer and an undoped Si layer.

### ***Response to Arguments***

Applicant's arguments filed 8/03/2006 have been fully considered but they are not persuasive. Regarding claim 40, Applicant argues that Ueno et al. teaches doping the polysilicon layer with either arsenic or antimony, but not both (see paragraph bridging pp. 10 and 11). While the examiner agrees that this is the case in the portion of the specification quoted by Applicant, Ueno et al. also claims in claim 1 that the polysilicon film is doped with "at least one of arsenic and antimony," which includes the combination of arsenic *and* antimony.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 1:00.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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